

CLAIMS

1. A polyolefin nanocomposite composition comprising:
 - A. 5 to 20 wt% of a compatibilizing dispersant chosen from an olefin polymer peroxide, an ionomer of an olefin polymer peroxide, a grafted olefin polymer peroxide, and mixtures thereof;
 - B. 1 to 15 wt% of a smectite clay; and
 - C. 65 to 94 wt% of an olefin polymer material;wherein the sum of components A + B + C is equal to 100 wt%.
2. The composition of claim 1 comprising
 - A. 7 to 15 wt% of the compatibilizing dispersant;
 - B. 2 to 10 wt% of the smectite clay; and
 - C. 75 to 91 wt% of the olefin polymer material.
3. The composition of claim 1 wherein a starting material for preparing the compatibilizing dispersant A is chosen from propylene polymers, ethylene polymers, butene-1 polymers and mixtures thereof.
4. The composition of claim 1 wherein the olefin polymer material C is chosen from propylene polymers, ethylene polymers, butene-1 polymers and mixtures thereof.
5. The composition of claim 3, wherein the propylene polymers are chosen from:
 - (a) a homopolymer of propylene having an isotactic index greater than 80%;
 - (b) a random copolymer of propylene and an olefin chosen from ethylene and C₄-C₁₀ α -olefins, containing 1 to 30 wt% of the olefin, and having an isotactic index greater than 60%;
 - (c) a random terpolymer of propylene and two olefins chosen from ethylene and C₄-C₈ α -olefins, containing 1 to 30 wt% of the olefins, and having an isotactic index greater than 60%;
 - (d) an olefin polymer composition comprising:
 - (i) 10 parts to 60 parts by weight of a propylene homopolymer having an isotactic index of at least 80%, or a crystalline copolymer chosen from (a) propylene and ethylene, (b) propylene, ethylene and a C₄-C₈ α -olefin, and (c) propylene and a C₄-C₈ α -olefin, the copolymer having a propylene content of more than 85% by weight, and an isotactic index greater than 60%;

- (ii) 3 parts to 25 parts by weight of a copolymer of ethylene and propylene or a C₄-C₈ α -olefin that is insoluble in xylene at ambient temperature; and
- (iii) 10 parts to 80 parts by weight of an elastomeric copolymer chosen from (a) ethylene and propylene, (b) ethylene, propylene, and a C₄-C₈ α -olefin, and (c) ethylene and a C₄-C₈ α -olefin, the copolymer optionally containing from 0.5% to 10% by weight of a diene, and containing less than 70% by weight of ethylene, and being soluble in xylene at ambient temperature and having an intrinsic viscosity of 1.5 to 4.0 dl/g;

the total of (ii) and (iii), based on the total olefin polymer composition being from 50% to 90%, and the weight ratio of (ii)/(iii) being less than 0.4, wherein the composition is prepared by polymerization in at least two stages;

(e) a thermoplastic olefin comprising:

- (i) 10% to 60% of a propylene homopolymer having an isotactic index of at least 80%, or a crystalline copolymer chosen from (a) ethylene and propylene, (b) ethylene, propylene and a C₄-C₈ α -olefin, and (c) ethylene and a C₄-C₈ α -olefin, the copolymer having a propylene content greater than 85% and an isotactic index of greater than 60%;
- (ii) 20% to 60% of an amorphous copolymer chosen from (a) ethylene and propylene, (b) ethylene, propylene, and a C₄-C₈ α -olefin, and (c) ethylene and a α -olefin, the copolymer optionally containing from 0.5% to 10% of a diene, and containing less than 70% ethylene and being soluble in xylene at ambient temperature; and
- (iii) 3% to 40% of a copolymer of ethylene and propylene or an α -olefin that is insoluble in xylene at ambient temperature; and

(f) mixtures thereof.

6. The composition of claim 4, wherein the propylene polymers are chosen from:

- (a) a homopolymer of propylene having an isotactic index greater than 80%;
- (b) a random copolymer of propylene and an olefin chosen from ethylene and C₄-C₁₀ α -olefins, containing 1 to 30 wt% of the olefin, and having an isotactic index greater than 60%;

- (c) a random terpolymer of propylene and two olefins chosen from ethylene and C₄-C₈ α -olefins, containing 1 to 30 wt% of the olefins, and having an isotactic index greater than 60%;
- (d) an olefin polymer composition comprising:
 - (i) 10 parts to 60 parts by weight of a propylene homopolymer having an isotactic index of at least 80%, or a crystalline copolymer chosen from (a) propylene and ethylene, (b) propylene, ethylene and a C₄-C₈ α -olefin, and (c) propylene and a C₄-C₈ α -olefin, the copolymer having a propylene content of more than 85% by weight, and an isotactic index greater than 60%;
 - (ii) 3 parts to 25 parts by weight of a copolymer of ethylene and propylene or a C₄-C₈ α -olefin that is insoluble in xylene at ambient temperature; and
 - (iii) 10 parts to 80 parts by weight of an elastomeric copolymer chosen from (a) ethylene and propylene, (b) ethylene, propylene, and a C₄-C₈ α -olefin, and (c) ethylene and a C₄-C₈ α -olefin, the copolymer optionally containing from 0.5% to 10% by weight of a diene, and containing less than 70% by weight of ethylene, and being soluble in xylene at ambient temperature and having an intrinsic viscosity of 1.5 to 4.0 dl/g;the total of (ii) and (iii), based on the total olefin polymer composition being from 50% to 90%, and the weight ratio of (ii)/(iii) being less than 0.4, wherein the composition is prepared by polymerization in at least two stages;
- (e) a thermoplastic olefin comprising:
 - (i) 10% to 60% of a propylene homopolymer having an isotactic index of at least 80%, or a crystalline copolymer chosen from (a) ethylene and propylene, (b) ethylene, propylene and a C₄-C₈ α -olefin, and (c) ethylene and a C₄-C₈ α -olefin, the copolymer having a propylene content greater than 85% and an isotactic index of greater than 60%;
 - (ii) 20% to 60% of an amorphous copolymer chosen from (a) ethylene and propylene, (b) ethylene, propylene, and a C₄-C₈ α -olefin, and (c) ethylene and a α -olefin, the copolymer optionally containing from 0.5% to 10% of a diene, and containing less than 70% ethylene and being soluble in xylene at ambient temperature; and

- (iii) 3% to 40% of a copolymer of ethylene and propylene or an α -olefin that is insoluble in xylene at ambient temperature; and
- (f) mixtures thereof.
7. The composition of claim 3, wherein the ethylene polymers are chosen from:
- (a) homopolymers of ethylene;
 - (b) random copolymers of ethylene and an α -olefin chosen from C_{3-10} α -olefins;
 - (c) random terpolymers of ethylene and C_{3-10} α -olefins; and
 - (d) mixtures thereof.
8. The composition of claim 4, wherein the ethylene polymers are chosen from:
- (a) homopolymers of ethylene;
 - (b) random copolymers of ethylene and an α -olefin chosen from C_{3-10} α -olefins;
 - (c) random terpolymers of ethylene and C_{3-10} α -olefins; and
 - (e) mixtures thereof.
9. The composition of claim 3, wherein the butene-1 polymers are chosen from:
- (a) homopolymers of butene-1;
 - (b) copolymers or terpolymers of butene-1 with a non-butene α -olefin comonomer content from 1 to 15 mole %; and
 - (c) mixtures thereof.
10. The composition of claim 4, wherein the butene-1 polymers are chosen from:
- (a) homopolymers of butene-1;
 - (b) copolymers or terpolymers of butene-1 with a non-butene α -olefin comonomer content from 1 to 15 mole %; and
 - (c) mixtures thereof.
11. The composition of claim 1 wherein the smectite clay B is chosen from montmorillonite, nontronite, beidellite, volkonskoite, hectorite, saponite, sauconite, sobockite, stevensite, svinfordite and mixtures thereof.
12. The composition of claim 11 wherein the smectite clay B is montmorillonite.
13. The composition of claim 1 wherein the compatibilizing dispersant A is an olefin polymer peroxide containing greater than 1 mmol total peroxide per kilogram of the olefin polymer peroxide.

14. The composition of claim 1 wherein the compatibilizing dispersant A is a sodium ionomer of an olefin polymer peroxide.
15. The composition of claim 1 wherein the compatibilizing dispersant A is a grafted olefin polymer peroxide.
16. The composition of claim 15 wherein the grafted olefin polymer peroxide is grafted with a monomeric vinyl compound wherein a vinyl radical, $\text{CH}_2=\text{CHR}-$, in which R is H or methyl, is attached to a straight or branched aliphatic chain having 2-12 carbon atoms or to a substituted or unsubstituted aromatic compound having 6-20 carbon atoms, heterocyclic compound having 4-20 carbon atoms, or alicyclic ring compound having 3-20 carbon atoms in a mono or polycyclic compound.
17. The composition of claim 16 wherein the monomeric vinyl compound is chosen from acrylic acid, methacrylic acid, maleic acid, maleic anhydride, vinyl-substituted aromatic compound having 6-20 carbon atoms, vinyl-substituted heterocyclic compound having 4-20 carbon atoms, vinyl-substituted alicyclic compound having 3-20 carbon atoms and mixtures thereof.
18. The composition of claim 17 wherein the monomeric vinyl compound is acrylic acid.
19. The composition of claim 1 wherein the smectite clay B is treated with a quaternary ammonium salt.
20. A shaped article comprising the composition of claim 1.